ABSTRACT

The invention provides tapered-width micro-cantilevers and micro-bridges that give additional design parameters for controlling and synthesizing pull-in (i.e., actuation) voltages. The pull-in voltage of a tapered-width micro-cantilever is generally a function of the taper function of the width along the length, the initial width, and the length of the micro-cantilever. By controlling these design parameters, a specific pull-in voltage for a micro-cantilever is obtained. The formula for a pull-in voltage is determined based on the geometry of the micro-cantilever device and a plurality of derived pull-in voltages. The pull-in voltage is derived by iteratively solving a displacement vector as a function of applied voltage across the micro-cantilever device and setting the pull-in voltage to the voltage at which the solution does not converge. The formula is derived for linear-tapered width, parabolic-tapered width and exponential-tapered width micro-cantilevers.